REMARKS

Claims 89-94 and 99-110 are pending in the present application. In the Office Action dated January 26, 2005, claims 89-94 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,261,958 to Crevasse et al. (the Crevasse patent) or U.S. Patent No. 6,244,941 to Bowman et al. (the Bowman patent) alone or in view of U.S. Patent No. 5,461,907 to Tench et al. (the Tench patent). Claim 99 was rejected under 35 U.S.C. 103(a) as being unpatentable over the Bowman patent alone, or in view of the Tench patent. Claims 100-110 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Crevasse patent or the Bowman patent alone.

The embodiments disclosed in the present application will now be discussed in comparison to the cited references. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the cited references, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

The embodiments disclosed in the present application are generally directed to methods and apparatuses for releasably attaching a polishing pad to the platen of a planarization machine used to planarize a semiconductor wafer. In one embodiment, the platen of the planarization machine may include a conductive plate positioned within the platen that may be connected to an electrical signal source. The planarization medium may further include a support member that has a polishing pad attached to the support member. The electrical signal source may be a voltage capable of charging the conductive plate so that a planarization medium positioned adjacent to the conductive plate may be electrostatically attracted to the platen while the voltage is applied. As a result, the pad is retained on the platen by electrostatically attracting the support member to the platen. The support member may optionally include a locking device that engages a mating portion formed in the platen that resists vertical and/or lateral motion of the support member relative to the platen.

Another embodiment includes a polishing pad having a plurality of conductive particles distributed within the pad that may be electrostatically or electromagnetically attracted to the platen. When the polishing pad is electromagnetically attracted to the platen, the electrical signal source includes an electrical current that passes through the conductive plate to produce

the attractive force between the platen and the particles distributed in the polishing pad. In various embodiments, the particles may be distributed in the pad in a uniform manner, or they may be non-uniformly distributed. For example, the particles in the pad may be concentrated in a portion of the pad that is adjacent to the platen in order to enhance the electromagnetic or electrostatic attractive forces between the pad and the platen.

The Examiner has cited the Crevasse patent, which discloses an electromagnetic polishing pad retention apparatus. Referring in particular to Figure 3 of the Crevasse patent, an electromagnet 54 is positioned within a platen 40 that is coupled to a current source through a switch 56. The polishing pad 30 includes an upper layer 32 that is attached to a backside layer 36 formed of a magnetic material, such as a thin steel sheet. Accordingly, the backside layer 36 is attracted to the platen 40 when the electromagnet 54 is connected to the current source through the switch 56. The layer 36 is disclosed as a substantially planar member that is detachable from the platen by interruption of the current. The backside layer 36 also serves to protect the upper layer 32 of the polishing pad 30 from the force generated by the attractive force.

The Crevasse patent makes no mention of retaining the layer 36 on the platen 40 using electrostatic attractive forces. The Crevasse patent also does not disclose or fairly suggest that an electrostatic attractive force and an electromagnetic attractive force are interchangeable equivalents. Furthermore, the Crevasse patent fails to disclose or fairly suggest that the layer 36 may be replaced by a plurality of conductive particles distributed in the upper layer 32. Instead, the Crevasse patent clearly teaches away from replacing the layer 36 with a plurality of magnetic particles that are distributed within the upper layer 32 because the layer 36 also serves an important function of protecting the upper layer 32. Furthermore, the Crevasse patent teaches away from such a modification because it appears that the purpose of the embodiments disclosed therein is to use either a non-magnetic layer 34 or a magnetic layer 36 with a conventional polishing pad. Distributing conductive particles with a polishing pad would require formulating a new, non-conventional polishing pad, thus, eliminating some of the major advantages of the invention disclosed in the Crevasse patent. The Crevasse patent also fails to provide any teaching that such a modification would be advantageous so that less conductive material is used or to preserve the lifetime of the conductive material. The use of the backside layer 36 will not be subjected to substantial wear since there are minimal frictional forces experienced by it.

Instead, the backside layer 36 is compressed onto the platen 40. Therefore, the need to increase the lifetime of the backside layer 36 does not appear to be a problem. Also, distributing a plurality of conductive particles within the upper layer 32 may actually use more material than is present in the backside layer 36.

The Examiner has cited the Bowman patent. The Bowman patent similarly discloses an electromagnetic polishing pad retention apparatus. Referring to Figure 6, a plurality of electromagnetic elements 338 are positioned in the platen 328 that are coupled to a current source through a switch 340. A top plate member 332 is positioned on the platen 328, that further includes a polishing pad 326 that is attached to a surface of the member 332. When a current is applied to the electromagnetic elements 338, an electromagnetic attractive force is developed between the top plate member 332 and the platen 328.

The Bowman patent, however, also fails disclose or fairly suggest that the member 332 may be replaced by a plurality of conductive particles distributed in the polishing pad 326. As with the Crevasse patent, the Bowman patent clearly teaches away from distributing a plurality of conductive particles within the polishing pad 326 because it would eliminate one of the main advantages of the Bowman patent. Namely, facilitating removal and replacement of conventional polishing pads when they become worn. The Bowman patent also fails to provide any teaching that such a modification would be advantageous so that less conductive material is used or to preserve the lifetime of the conductive material. Furthermore, the Bowman patent fails to disclose that the polishing pad may be retained on the platen by electrostatic attractive forces or that an electrostatic force and an electromagnetic force are interchangeable equivalents.

Accordingly, modification of the Crevasse patent or the Bowman patent to distribute a plurality of conductive particles in a polishing pad would be the result of impermissible hindsight and destroy several of the advantages provided by the embodiments disclosed in both the Crevasse and Bowman patents.

The Examiner has also cited the Tench patent for purportedly disclosing the functional equivalence of electromagnetic and electrostatic forces. The Tench patent is directed to an atomic force microscope (AFM) apparatus for imaging small objects. The Tench patent does not pertain to the field of holding a substrate on a platen and planarizing the substrate, and should be considered non-analogous art. The Tench patent discloses that the cantilever 12′ is

forced downwardly toward the substrate 14 using an electrostatic or an electromagnetic force. However, the relevant teachings of the Tench patent are exactly how substrate 14 is attached to a platen. However, the Tench patent appears to be silent as to how the substrate 14 is attached while it is being analyzed by the AFM. Accordingly, the Tench patent would not motivate one of ordinary skill in the art to select between an electrostatic or an electromagnetic force to hold a substrate on a platen.

The Examiner has asserted that the use of an electrostatic attractive force and an electromagnetic attractive force are known interchangeable equivalents. Applicants continue to maintain that the use of an electrostatic attractive force and an electromagnetic attractive force are not known interchangeable equivalents as discussed in detail in the previous office action response filed on November 1, 2004. Furthermore, the cited references do not disclose or fairly suggest that an electrostatic force and an electromagnetic force are interchangeable equivalents.

Turning now to the claims, the patentably distinct differences between the cited references and the claim language will be specifically pointed out. Claim 89 recites in part, "...applying a signal to the platen that produces *an electrostatic attractive force between the platen and the planarizing medium.*" (Emphasis added). As noted above, the combination of the cited references do not disclose or even fairly suggest removably attaching the polishing pad by producing an electrostatic attractive force between the polishing pad and the platen. In addition, as also noted above, electrostatic and electromagnetic forces cannot reasonably be regarded as equivalents as asserted by the Examiner. Claim 89 is therefore allowable over the cited references. Claims depending from claim 89 are also allowable due to depending from an allowable base claim and further in view of the additional limitations recited in the dependent claims.

Claim 100 recites in part, "*...distributing a plurality of conductive particles in the planarizing medium*...and...applying a signal to the platen that produces an electromagnetic attractive force between the platen and the conductive particles in the planarizing medium." (Emphasis added). The combination of the cited references do not disclose or even fairly suggest a distribution of conductive particles in the planarizing medium. Instead, the Crevasse and Bowman patents teach away from distributing a plurality of conductive particles in the planarizing medium because both references emphasize techniques for holding a conventional

polishing pad, and further teach the importance of the having a conductive backside layer to protect the polishing pad. The Examiner has not set forth a convincing line of reasoning as to why one of ordinary skill in the art would place conductive particles within the planarizing medium of the Crevasse patent or the Bowman patent. The reason asserted by the Examiner for modifying the Crevasse and Bowman patents of preserving the lifetime of the conductive material or using less material must be found in the references or knowledge generally available to one of ordinary skill in the art. However, the above reasons are not found in the Crevasse and Bowman patents or knowledge generally available to one of ordinary skill in the art. Thus, any modification of the cited references is the result of impermissible hindsight. Therefore, claim 100 is allowable over the cited references.

Claims depending from claim 100 are also allowable due to depending from an allowable base claim and further in view of the additional limitations recited in the dependent claims. For example, claim 104 recites "wherein distributing a plurality of conductive particles further comprises distributing the plurality of conductive particles uniformly in the planarizing medium." The Crevasse and Bowman patents fail to teach or fairly suggest the above limitations. Furthermore, the particular placement of the conductive particles within the planarizing medium is not an arbitrary design choice as asserted by the examiner. The concentration of the particles helps increase the effect of the force between the planarizing medium and the platen.

Claim 107 similarly recites in part, "[a] method for releasably attaching *a planarizing medium having a plurality of internally distributed conductive particles* to a platen of a planarization machine, comprising...positioning the planarization medium adjacent to the platen...and...coupling a signal to the platen *to produce an electromagnetic attractive force between the conductive particles and the platen."* (Emphasis added). Again, the combination of the cited references do not disclose or even fairly suggest a planarizing medium having conductive particles internally distributed. Claim 107 is therefore allowable over the cited references.

Claims depending from claim 107 are also allowable due to depending from an allowable base claim and further in view of the additional limitations recited in the dependent claims. For example, claim 108 recites "wherein the planarizing medium includes an attachment

surface having a concentration of conductive particles located proximate to the attachment surface, and positioning the planarizing medium is further comprised of positioning the attachment surface on the platen." The Crevasse and Bowman patents fail to disclose or fairly suggest the above limitations.

All of the claims remaining in the application (claims 89-94 and 99-110) are now clearly allowable. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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